

CLAIMS

I claim:

- 5        1. A method of obtaining balanced phase shift operation, comprising  
          A) employing a resonator supporting nonreciprocal wave propagation which can be  
              divided in two parts showing symmetry and is loaded with electronically active  
              material or materials,  
          B) applying electronic means to bias said resonator with respect to said  
10        electronically active material or materials in a manner counter-reacting each  
              other for said two parts of said resonator causing insignificant change in the  
              overall resonance condition,  
          wherein said electronic means induce effectively shift in the coupling positions of  
              feeders in reference to said resonator in the electrical sense, resulting in phase shift of  
15        the transmitted signal or waveform from said resonator whose amplitude depends  
              insignificantly on the derived angle in said phase shift thereby realizing said balanced  
              phase shift operation.
- 20        2. A balanced phase shifter device, comprising  
          A) a resonator supporting nonreciprocal wave propagation which can be divided in  
              two parts showing symmetry and is loaded with electronically active material or  
              materials,  
          B) electronic means to bias said resonator with respect to said electronically active  
              material or materials in a manner counter-reacting each other for said two parts  
25        of said resonator causing insignificant change in the overall resonance condition,  
          wherein, said electronic means induce effectively shift in the coupling positions of  
              feeders in reference to said resonator in the electrical sense, resulting in phase shift of  
              the transmitted signal or waveform from said resonator whose amplitude depends  
              insignificantly on the derived angle in said phase shift thereby realizing the balanced  
              phase shift operation.

3. The balanced phase shifter device of Claim 2 wherein said electronically active material or materials include cubic/hexagonal ferrite or ferrites, ferroelectrics, semiconductor junctions such as diodes or transistors, or in combination,  
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4. The balanced phase shifter device of Claim 2 wherein said electronic means include the application of bias voltages, bias currents, bias electric fields, and/or bias magnetic field or fields.
- 10 5. The balanced phase shifter device of Claim 2 wherein said resonator assumes the geometry of microstrip, stripline, coplanar waveguide, slotline, finline, image line, waveguide, coax line, parallel wire, or in combination, including coupled transmission lines.
- 15 6. The balanced phase shifter device of Claim 2 wherein said feeders couple to said resonator via the mechanism of conductive coupling, inductive coupling, capacitive coupling, or in combination.
7. The balanced phase shifter device of Claim 2 wherein said resonator assumes  
20 the shape of a disk or a ring not necessarily to show the circular symmetry.
- 25 8. The balanced phase shifter device of Claim 2 wherein said nonreciprocal wave propagation results from said electronically active material or materials, the corporate in-phase feeding configuration adopted by said feeders, or in combination.

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**SEQUENCE LISTING**

**(Not Applicable)**